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Summary of Work for NSF *DMI-0245352*
Coordinating Inventory Control and Pricing Strategies
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For NSF grant DMI-0245352, collaborator Julie Swann and her Ph.D. students focused on several areas of pricing and inventory control. One area they worked on is adding discretionary sales to a manufacturing system, where inventory may be reserved in a current time period to satisfy future demand. This may be used to improve flexibility and profitability of a manufacturing system. When there is no fixed ordering cost and pricing is determined in advance, an optimal policy for production and reserving results that specifies critical thresholds, up to which a manufacturer should order or reserve as much as capacity allows. For a single class of customers, these results are summarized in paper 2 below.

In paper 3 below, Swann and co-authors extended the notion of discretionary sales or reserve inventory to two classes of customers. They also added an additional tactical inventory decision that specifics planned backlogging for either or both of the two inventory classes. When customer class 1 pays a premium to have priority over customer class 2 in the current period, then an optimal threshold policy results for production, reserving, and backlogging decisions. The reserving and backlogging decisions are further nested by customer class. Similar tactical inventory results have also been found for production systems where only first class customers are served immediately and second class customers receive a discount for delayed fulfillment (paper in preparation).

Several other papers have resulted from the work of Swann and other investigators and have been supported by this grant (see below for a list). For instance, in paper 4 below, the authors study leadtime quotation and demand acceptance policies for a system where customers are sensitive to past service. The assumption is that customer's willingness to accept decreases in the leadtime quoted, and that the future arrival of customers decreases if past orders are not met on time. The optimal leadtime quote under infinite capacity is longer than in the case where service is ignored. For the case of finite capacity, a threshold policy is not optimal in general but is found to be optimal if production is processed in batches. For the general case, several heuristics are developed and their performance is analyzed in computations.

In addition to the research performed under this grant, Investigator Swann developed several lectures on pricing research for use in two graduate courses in the School of Industrial and Systems Engineering and developed lecture material for a short course in The Logistics Institute, which reached a number of managers in industry.

1. Biller, S. and J. Swann (2006). "Pricing for Environmental Compliance in the Automotive Industry." *Interfaces*, 36(2): 118-125.

2. Chan, L. M. A., D. Simchi-Levi and J. Swann (2006). "Pricing, Production and Inventory Policies for Manufacturing with Stochastic Demand and Discretionary Sales." *Manufacturing and Service Operations Management*, 8(2): 149-168.
3. Duran, S., T. Liu, D. Simchi-Levi and J. Swann. "Demand Management of Price and Time Differentiated Customers." Forthcoming in *IIE Transactions* (accepted August 2006).
4. Duran, S., A. Gulcu, P. Keskinocak, and J. Swann. "Leadtime Quotation and Order Acceptance when Demand Depends on Service Performance." Submitted to *Operations Research* (July 2006).
5. Duran, S., A. Gulcu, P. Keskinocak and J. Swann (2005). "Quoting Customer Leadtimes when Customers are Service Sensitive". Proceedings of *Manufacturing and Service Operations Management Conference*, Evanston, IL, June 27 - 28.